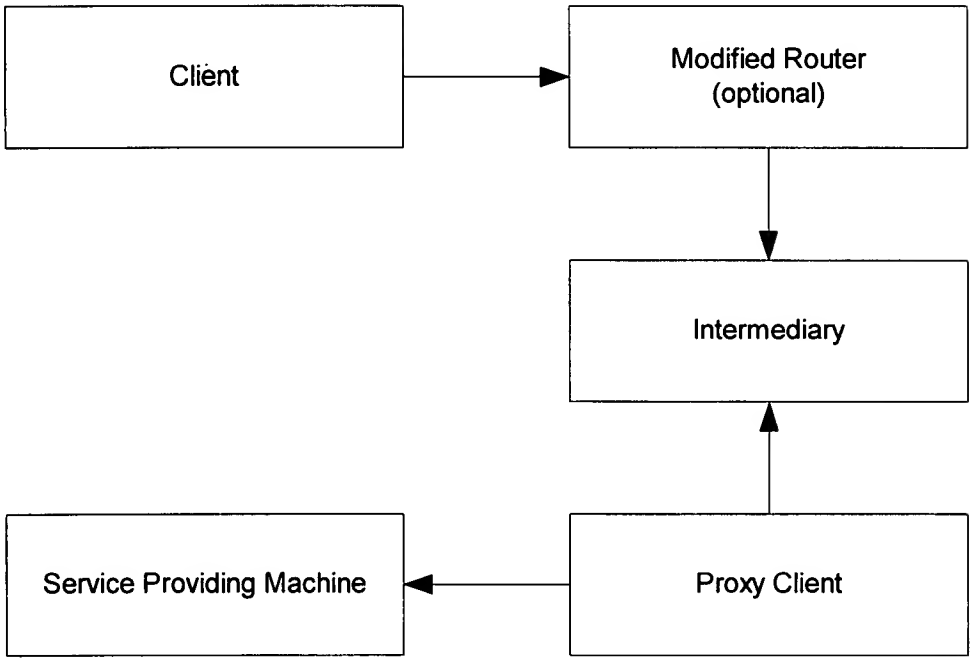
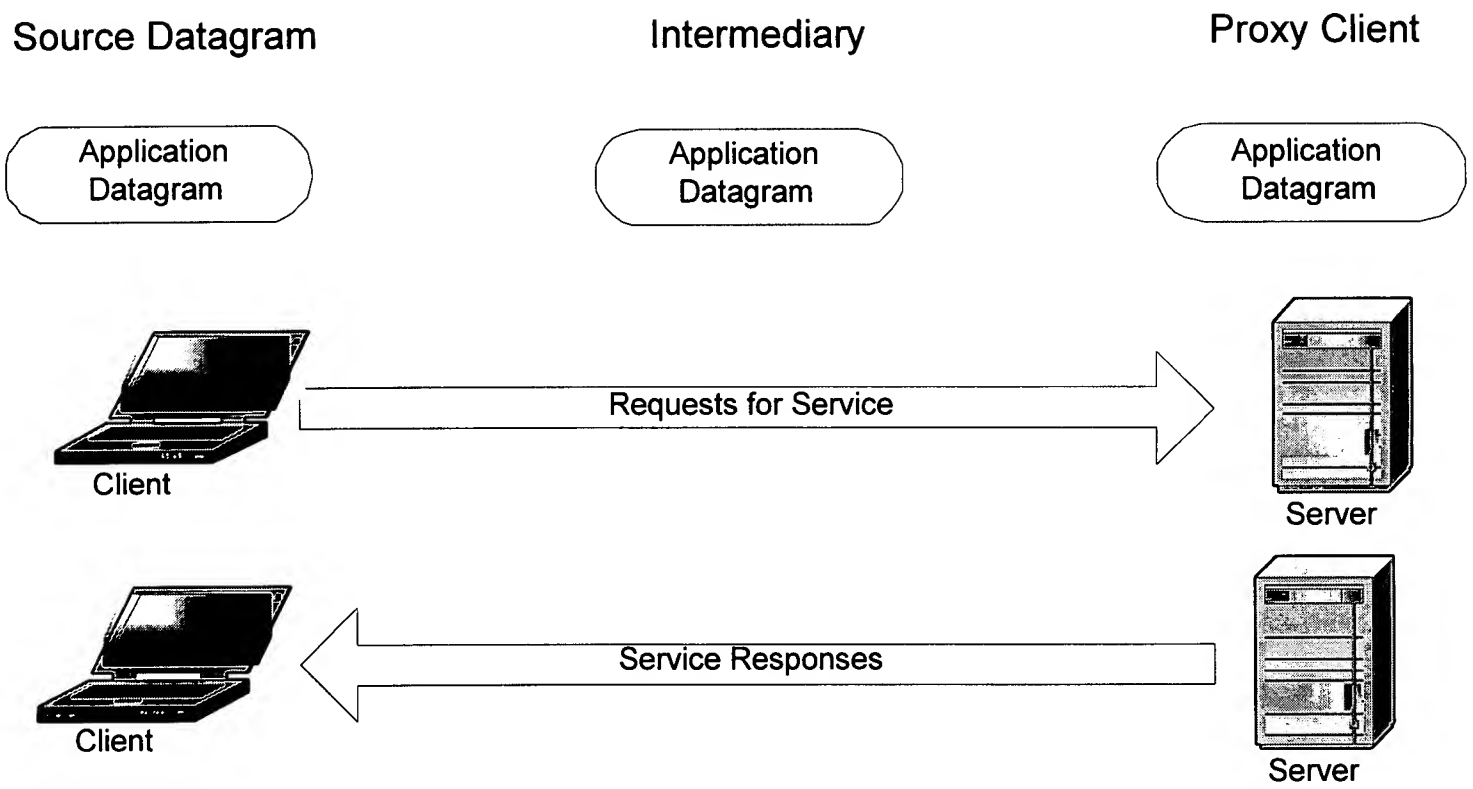
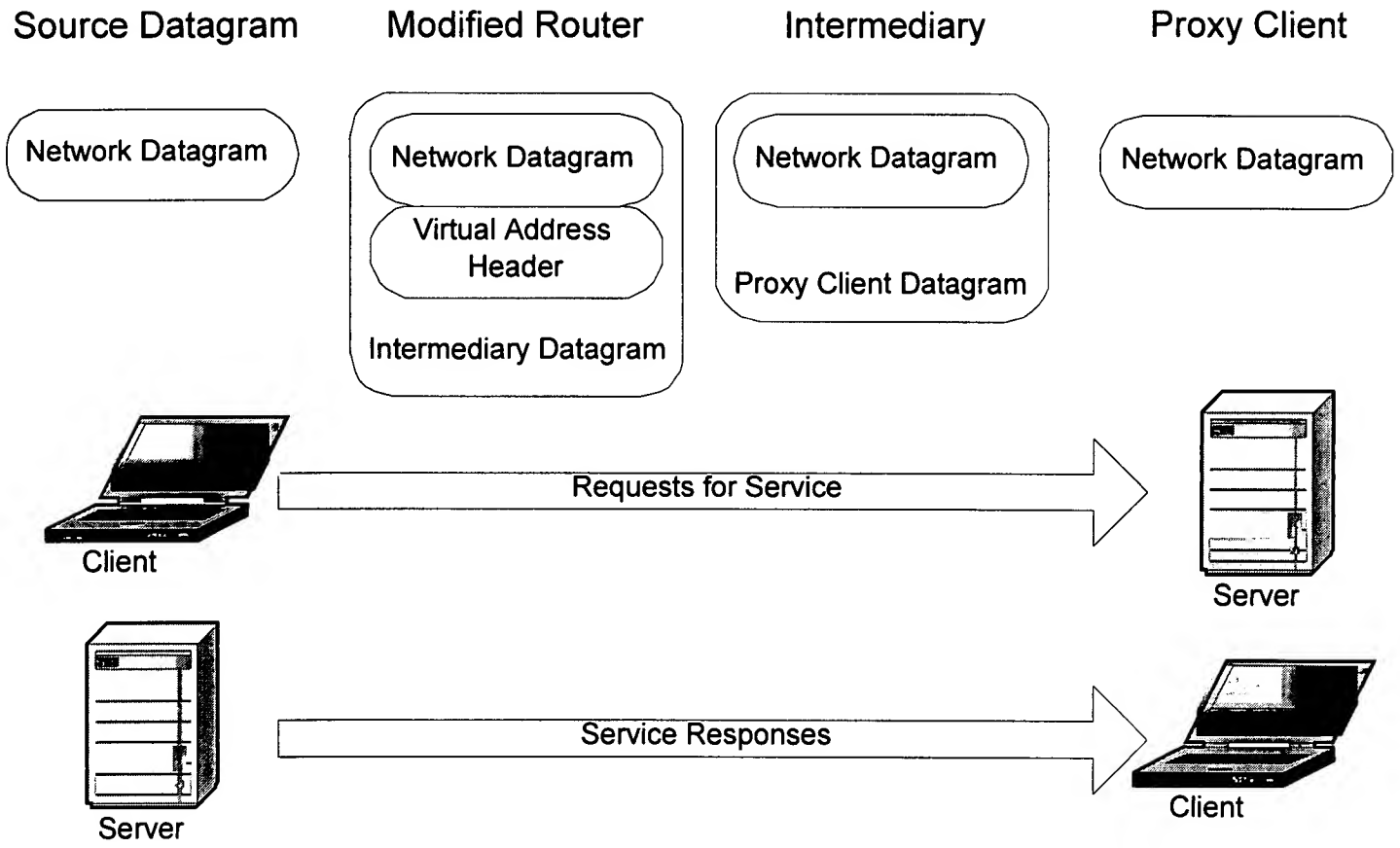
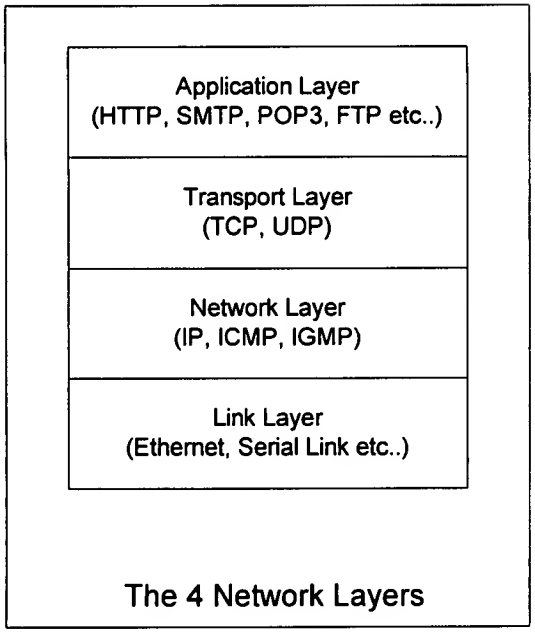
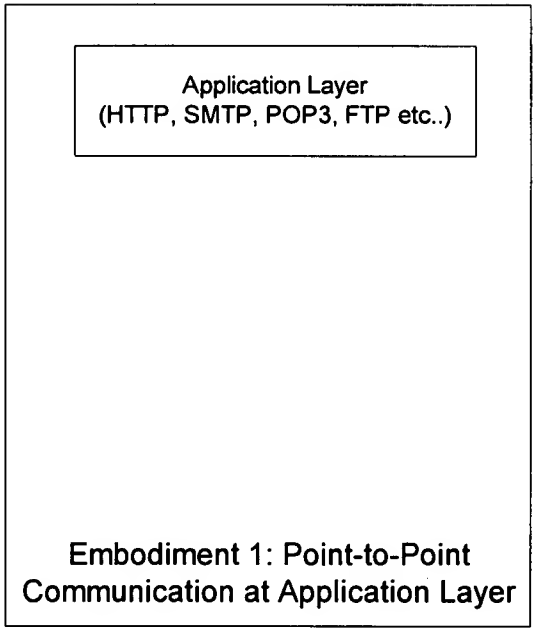
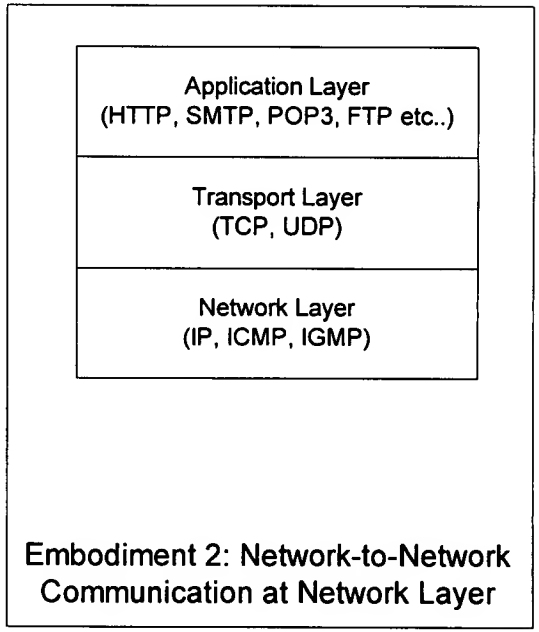

Client
Modified Router
(optional)
Intermediary
Service Providing Machine
Proxy Client

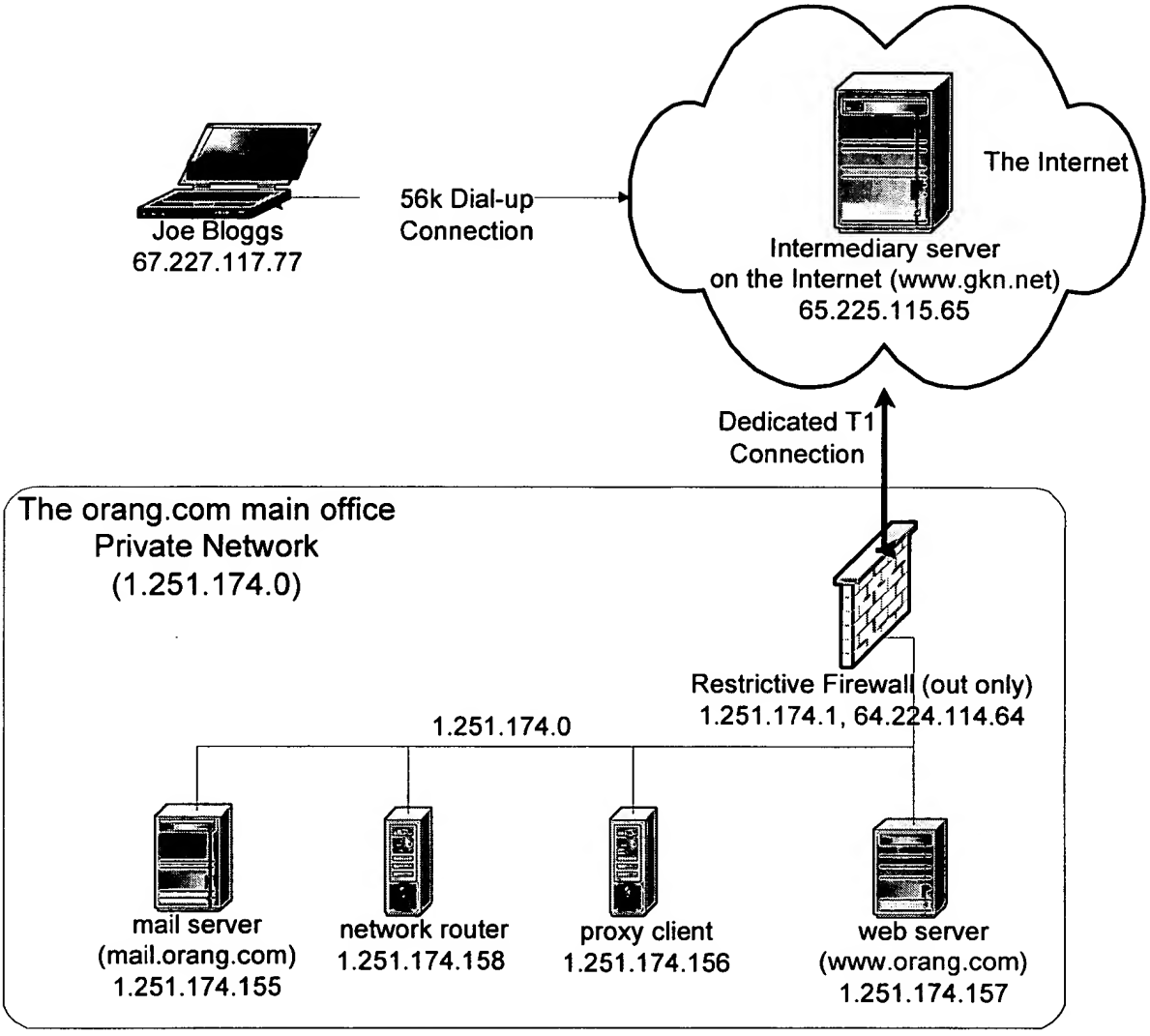

Source Datagram
Intermediary
Proxy Client
Application Datagram
Application Datagram
Application Datagram
Requests for Service
Client
Server
Service Responses
Client
Server

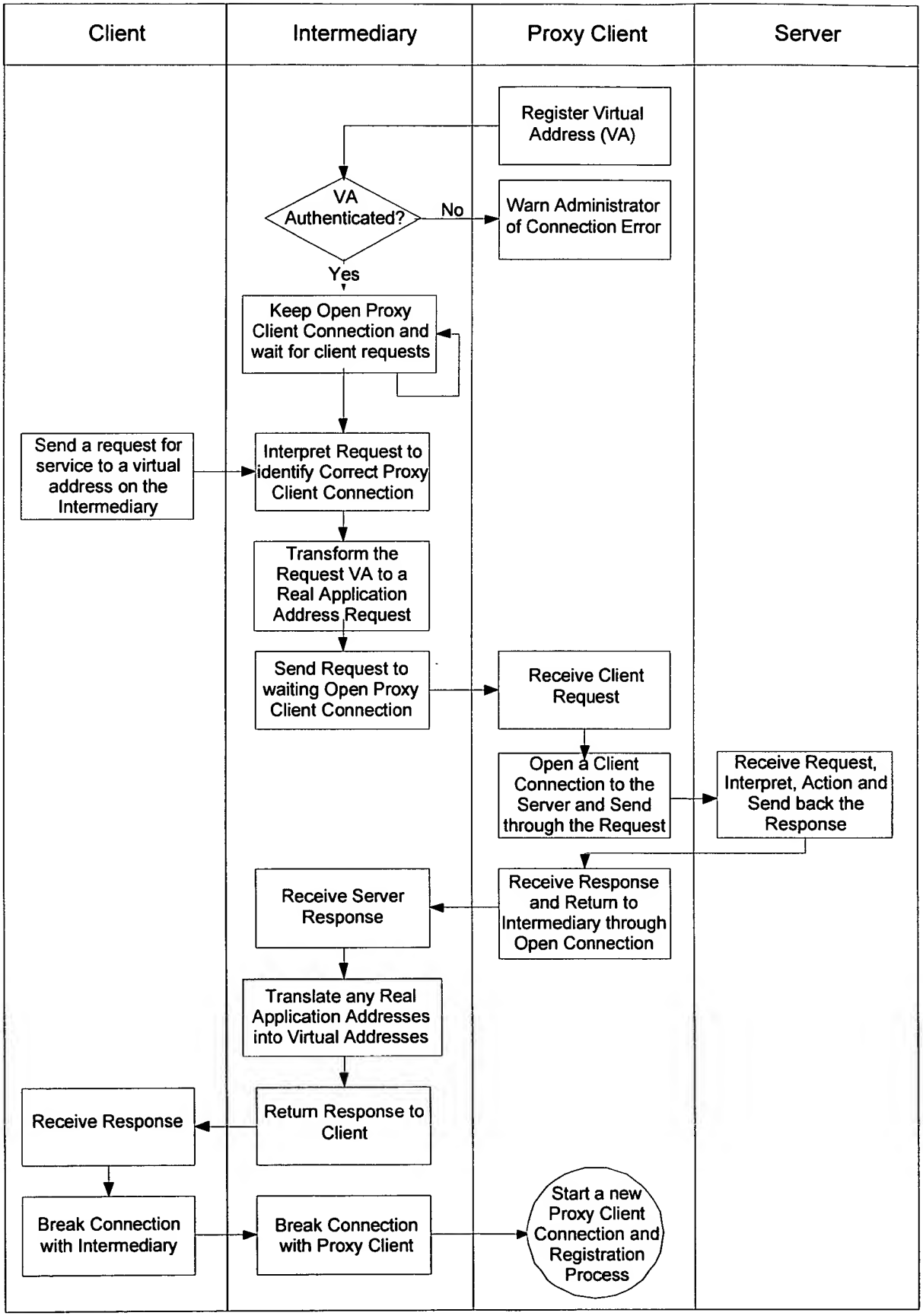

Source Datagram
Modified Router
Intermediary
Proxy Client
Network Datagram
Network Datagram
Virtual Address Header
Intermediary Datagram
Network Datagram
Proxy Client Datagram
Network Datagram
Client
Requests for Service
Server
Server
Service Responses
Client

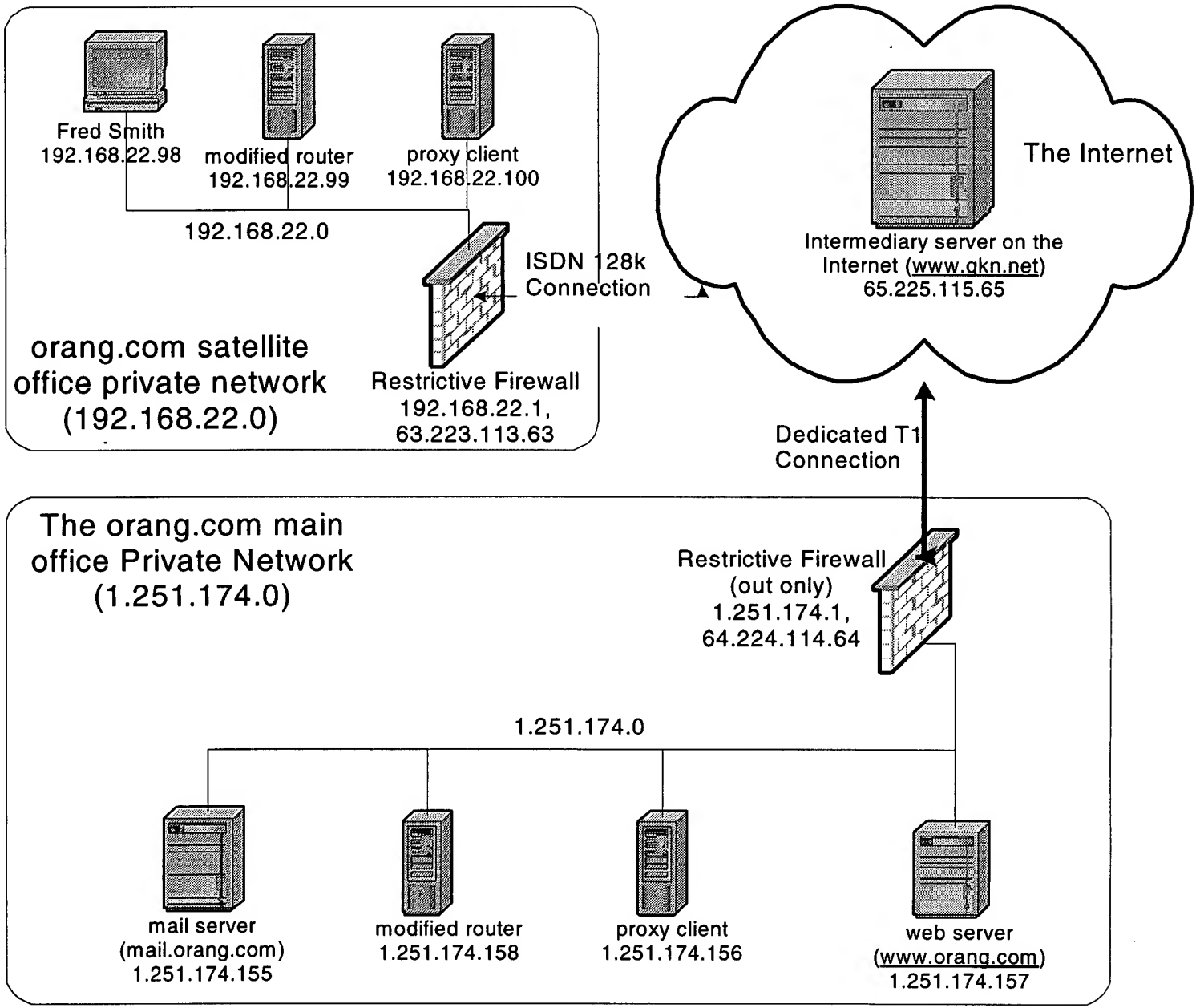

Application Layer
(HTTP, SMTP, POP3, FTP etc..)
Transport Layer
(TCP, UDP)
Network Layer
(IP, ICMP, IGMP)
Link Layer
(Ethernet, Serial Link etc..)
The 4 Network Layers

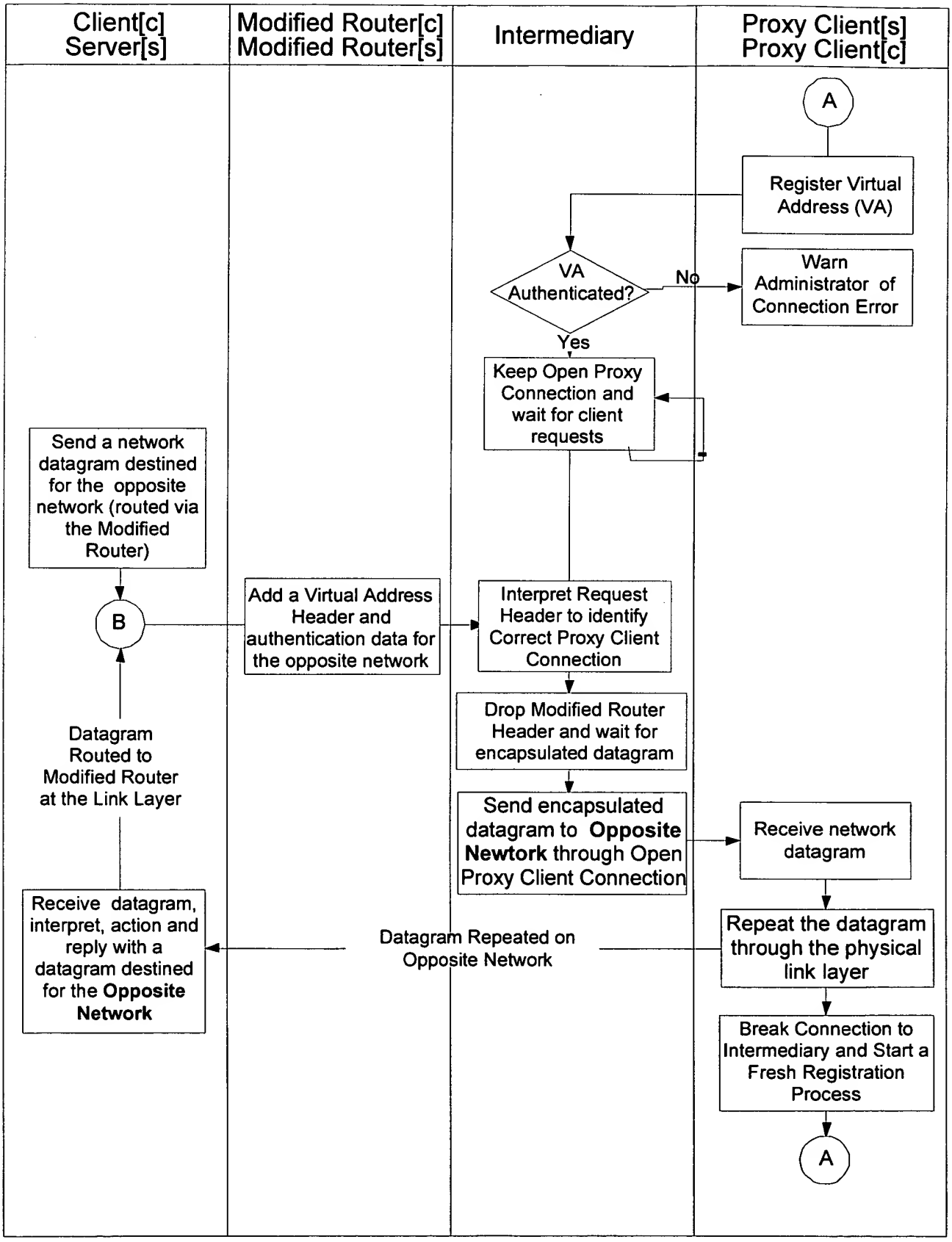

Application Layer
(HTTP, SMTP, POP3, FTP etc..)
Embodiment 1: Point-to-Point
Communication at Application Layer


Application Layer
(HTTP, SMTP, POP3, FTP etc..)
Transport Layer
(TCP, UDP)
Network Layer
(IP, ICMP, IGMP)
Embodiment 2: Network-to-Network
Communication at Network Layer


Joe Bloggs
67.227.117.77
56k Dial-up
Connection
The Internet
Intermediary server
on the Internet (www.gkn.net)
65.225.115.65
Dedicated T1
Connection
The orang.com main office
Private Network
(1.251.174.0)
Restrictive Firewall (out only)
1.251.174.1, 64.224.114.64
1.251.174.0
mail server
(mail.orang.com)
1.251.174.155
network router
1.251.174.158
proxy client
1.251.174.156
web server
(www.orang.com)
1.251.174.157


Client
Intermediary
Proxy Client
Server
Register Virtual Address (VA)
VA Authenticated?
No
Warn Administrator of Connection Error
Yes
Keep Open Proxy Client Connection and wait for client requests
Send a request for service to a virtual address on the Intermediary
Interpret Request to identify Correct Proxy Client Connection
Transform the Request VA to a Real Application Address Request
Send Request to waiting Open Proxy Client Connection
Receive Client Request
Open a Client Connection to the Server and Send through the Request
Receive Request, Interpret, Action and Send back the Response
Receive Response and Return to Intermediary through Open Connection
Receive Server Response
Translate any Real Application Addresses into Virtual Addresses
Return Response to Client
Receive Response
Break Connection with Intermediary
Break Connection with Proxy Client
Start a new Proxy Client Connection and Registration Process


Fred Smith
192.168.22.98
modified router
192.168.22.99
proxy client
192.168.22.100
192.168.22.0
ISDN 128k
Connection
orang.com satellite
office private network
(192.168.22.0)
Restrictive Firewall
192.168.22.1,
63.223.113.63
The Internet
Intermediary server on the
Internet (www.gkn.net)
65.225.115.65
Dedicated T1
Connection
The orang.com main
office Private Network
(1.251.174.0)
Restrictive Firewall
(out only)
1.251.174.1,
64.224.114.64
1.251.174.0
mail server
(mail.orang.com)
1.251.174.155
modified router
1.251.174.158
proxy client
1.251.174.156
web server
(www.orang.com)
1.251.174.157


Client[c]
Server[s]
Modified Router[c]
Modified Router[s]
Intermediary
Proxy Client[s]
Proxy Client[c]
A
Register Virtual Address (VA)
VA Authenticated?
No
Warn Administrator of Connection Error
Yes
Keep Open Proxy Connection and wait for client requests
Send a network datagram destined for the opposite network (routed via the Modified Router)
B
Add a Virtual Address Header and authentication data for the opposite network
Interpret Request Header to identify Correct Proxy Client Connection
Drop Modified Router Header and wait for encapsulated datagram
Datagram Routed to Modified Router at the Link Layer
Send encapsulated datagram to Opposite Newtork through Open Proxy Client Connection
Receive network datagram
Receive datagram, interpret, action and reply with a datagram destined for the Opposite Network
Datagram Repeated on Opposite Network
Repeat the datagram through the physical link layer
Break Connection to Intermediary and Start a Fresh Registration Process
A